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A Multivariate Study of Three Prehistoric Tennessee Skeletal Populations: Mouse Creek, Dallas, and Middle Cumberland

Hugh E. Berryman
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Hugh E. Berryman entitled "A Multivariate Study of Three Prehistoric Tennessee Skeletal Populations: Mouse Creek, Dallas, and Middle Cumberland." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

William M. Bass, Major Professor

We have read this thesis and recommend its acceptance:

Charles H. Faulkner, Richard L. Jantz

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Vice Chancellor
Graduate Studies and Research

A MULTIVARIATE STUDY OF THREE PREHISTORIC TENNESSEE SKELETAL POPULATIONS: MOUSE CREEK, DALLAS, AND MIDDLE CUMBERLAND

A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee

Hugh E. Berryman

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Lastly, I wish to thank my wife, Treva, who assisted me in many aspects of my data gathering. Her continued encouragement and patience have guided me through a difficult project. My gratitude also goes out to my parents, Mr. and Mrs. W. C. Berryman, who assisted me in many ways during my academic career.

ABSTRACT

The purpose of this study was to employ the techniques of physical anthropology in the examination of an archaeological hypothesis set forth by Thomas M. N. Lewis and Madeline Kneberg in the 1940's. This hypothesis concerned the possible Middle Tennessee origin of the Mouse Creek people. Mouse Creek cultural remains (e.g. settlement pattern, architecture, burial customs, and pottery) were judged to differ from their nearest contemporary neighbors, the Dallas, while showing certain similarities to the Middle Cumberland culture of Middle Tennessee.

A multivariate statistical analysis using 22 craniofacial measurements was applied to skeletal material representing these three populations: the Mouse Creek and Dallas people from the eastern Tennessee Valley area and the Middle Cumberland people from the Cumberland Valley area in Middle Tennessee. The statistical approach used was that developed by Mahalanobis (1936), as modified by Goodman (1972). The resulting distances were expressed by Gower's (1972) principal coordinate analysis. The three groups, as well as the individual sites from which they were composed, were analyzed.

The biological distances indicate that the Mouse Creek males did not differ (at the 0.05 level) from either the Middle Cumberland or Dallas males. This was also the case for the Mouse Creek and Middle Cumberland females; however, the Mouse Creek females were distinct (at the 0.025

level) from the Dallas females. Similar relationships were also expressed by the individual sites. These results are supportive of the Lewis and Kneberg hypothesis and may further suggest a matrilocal kinship system for the three groups. These same relationships may also result from gene flow produced by political alliances and widespread trade and travel throughout the entire area. Such interactions would be stimulated by a common linguistic background.

These two possibilities are not mutually exclusive. Both the metric and archaeological data support the Lewis and Kneberg hypothesis. However, gene flow from years of trade, travel, and alliances is also a likely factor.

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CHAPTER I

INTRODUCTION

The origin and relationship of late prehistoric cultural manifestations in the Middle South have been an issue in southeastern archaeology for a number of years. Two principal points of view concerning the relationship of these cultures have been voiced. The first of these is that the cultures found in this area were, for the most part, the result of indigenous development. Perhaps the first to voice such a view was Cyrus Thomas (1894:694) who believed that the Cherokee occupied this area "from time immemorial." More recent archaeologists as well (Faulkner 1972; 1975) see indigenous development of groups as a likely occurrence. Joffre L. Coe (1961) also expresses this view in relation to the Cherokee by proposing that their ancestors may have occupied the same area since the Archaic period.

However, the more traditional viewpoint prevailing in the past is that the different cultural manifestations represent the intrusion of different groups into a given area. Thomas M. N. Lewis and Madeline Kneberg (1941; 1946; 1955), two major proponents of this idea, view the historical tribes of the eastern Tennessee Valley (the Cherokee, Creek, and Yuchi) as resulting from such movements. It is with their interpretation of the origin of the Yuchi--a name they consider synonymous with Mouse Creek--that this thesis is concerned.

Statement of the Problem

In eastern Tennessee, along the Tennessee and Hiwassee rivers, two protohistoric cultural complexes are represented--the Dallas and the Mouse Creek (Lewis 1943:311). Formerly called foci or cultures, these complexes have recently been described as the Dallas and Mouse Creek phases (Faulkner 1972; 1975). This terminology will be used in the present study. The purpose of this study is to investigate an hypothesis proposed by Thomas M. N. Lewis and Madeline Kneberg concerning the origin of the Mouse Creek culture and its relationship to the Dallas culture. Lewis and Kneberg (1946:14) note that: "There is just enough variation between the Mouse Creek and Dallas cultures to indicate that different peoples were responsible for them. On the other hand they share enough traits to suggest that they were approximately contemporaneous. . . ." Some of the characteristics which markedly differentiate the Dallas culture from the Mouse Creek culture can be seen ". . . in the community plan, architecture, burial customs and pottery, although the other industries show important differences" (Lewis and Kneberg 1941:12). Kneberg (1952:198) goes a step farther by suggesting that the Mouse Creek people were prehistoric Yuchi and migrated into eastern Tennessee from the middle Cumberland Valley. A number of cultural traits have been cited which tend to link the Yuchi with earlier peoples in Middle Tennessee (Kneberg 1952; Lewis and Kneberg 1955:73-82), specifically the Middle Cumberland people. The Middle

Cumberland culture, also called the Gordon culture, is a Mississippian cultural manifestation located along the Cumberland Valley in Middle Tennessee.

In the past only archaeological and ethnohistoric accounts have been utilized in an attempt to clarify the relationship of these three groups. The present study proposes to test the validity of the Lewis and Kneberg hypothesis by examining the biological or morphological distance between Mouse Creek and the Dallas skeletal material of the eastern Tennessee Valley, and Mouse Creek and the Middle Cumberland skeletal material of Middle Tennessee. To achieve this, a multivariate statistical analysis has been applied to cranial and cranio-facial measurements made on the material available from those sites representing each group. Such statistical methods have enjoyed considerable success in physical anthropology and may be useful in adding support or making inferences concerning certain archaeological interpretations.

For the last decade physical anthropology has made extensive use of multivariate statistical techniques as applied to problems concerning human skeletal populations. W. W. Howells' (1973) study, which makes inferences concerning the morphological distance of skeletal populations representing five geographic regions, best exemplifies a large-scale application of such techniques. Howells (1969:314) defines one advantage offered by this procedure over early methods in his following statement:

> . . . analysis of multivariate variables, such as a set of descriminant functions, will show where the essential differences in shape actually lie, something which cannot be reliably achieved by univariate methods.

Such statistical techniques have also contribured useful information relevant to small, more closely associated population units. This aspect of multivariate analysis is best illustrated by Jantz (1972; 1973; 1974) in his work with the microevolutionary change in Plains Indian skeletal populations. Recently, Wright (1974) conducted a similar study in which she attempted to test hypotheses concerning the origin of the historic Cherokee. Wright (1974:4) utilized Penrose's (1954) "size" and "shape" distance to quantify the morphological difference between populations. Unfortunately, this work was greatly handicapped by an absence of a historic Creek skeletal population central to the study. The present study is similar to the Wright study in many respects but differs in the statistical procedure applied. Mahalanobis' (1936) Generalized Distance, or D^2, was employed as a test of biological distance as opposed to the Penrose method used by Wright. The distances established through this procedure are more completely analyzed by the use of principal coordinates (Gower 1972).

The Significance of the Study

The Lewis and Kneberg (1955; Kneberg 1952) interpretation of the Middle Tennessee origin of the Mouse Creek phase and its relationship to the Dallas phase and the Middle

Cumberland culture has, in the past, generated some concern and doubt among southeastern archaeologists. Therefore, the contribution of this study lies in its potential for more clearly defining the relationship, or morphological distance, between these three groups. Furthermore, each of these three populations herewith is comprised of a number of sites, making possible some suggestion of the intersite biological connections within each culturally defined group.

In a more general sense, the archaeologist relies on a number of specialists (e.g. zooarchaeologists, botanists, geologists, etc.) for the reconstruction of prehistory. This thesis may serve to exemplify the interpretative potential of skeletal studies for such reconstructions and thus encourage further studies of this nature in the future.

CHAPTER II

ETHNOHISTORIC AND ARCHAEOLOGICAL ASPECTS

A preliminary discussion based on both the ethnohistoric and archaeological aspects of the origin of the Mouse Creek people and their possible connection with the Dallas and Middle Cumberland cultures will help to better establish the problem. To achieve this, pertinent information concerning each of the three populations are reviewed under separate subheadings followed by a summary.

The Mouse Creek Phase

Lewis and Kneberg (1941; 1955) identified the Mouse Creek people with a historic group in the Southeast known as the Yuchi. This affinity was based on Swanton's (1919) identification of the Yuchi with the Chisca and also on the basis of certain cultural traits shared by the historic Yuchi and the Mouse Creek phase. However, the ethnic relationship of the Mouse Creek phase is still an issue. Mason (1963:550) indicates that "Swanton's identification of Yuchi with Chisca rests solely upon associations inferred from similar geographical locations [based on reports made by the DeSoto expedition] during the historic period. . . ." Mason feels that the Yuchi may be more closely related to the Dallas phase than to Mouse Creek. However, Bauxar (1957a; 1957b), in a detailed discussion of the Yuchi, agrees with the Lewis and Kneberg interpretation. It is difficult to discuss the Lewis and Kneberg hypothesis concerning the origin of the

Mouse Creek phase without also incorporating their views of its ethnic relationships. However, it should be remembered that the origin of the Mouse Creek people and their relationship with the Dallas, rather than their ethnic ties, are the central issues here. The term *Yuchi*, as applied in this paper, refers directly to the Mouse Creek phase unless indications are made to the contrary.

Some of the same cultural traits of the Mouse Creek phase which Lewis and Kneberg deem important links with the Yuchi may also be suggestive of Middle Cumberland connections. These traits--settlement pattern, architecture, mortuary practices, ceramics, etc.--were mentioned in the previous chapter and will be more fully discussed below.

The Mouse Creek phase derives its name from its location on the Hiwassee River at a point where the North Mouse Creek and the South Mouse Creek empty into it. Its distribution in East Tennessee is limited, for the most part, to this river with the Hampton site, located on the Tennessee River in the Watts Bar Basin, being the only exception noted by Lewis and Kneberg (1941:7).

The settlement pattern or community plan of these people

> . . . showed closely grouped habitations frequently within a stockade. The dwellings were placed in an orderly arrangement, occasionally around a central open court. There were no elevated foundations for the community buildings, and such structures, if their function may be inferred from their unusually large size in contrast to that of the dwellings, did not show any special features (Lewis and Kneberg 1941:7).

Lewis and Kneberg (1955:82) further suggest that the absence of temple mounds among the Yuchi (Mouse Creek) may reflect the fact that their occupation in East Tennessee was of such short duration as not to allow mound construction.

The architecture or house type is one of the most distinctive cultural features of the Mouse Creek people; the structures consisted of subsurface floors averaging 1-1/2 feet in depth. The pits were rectangular in shape with large posts set close to their margin.

> These logs varied from six to nine inches in diameter and formed a rigid framework which supported the roof beams, possibly by crotches at the top. The large posts were set one to two feet apart, and to them was fastened a wattle work of split canes. . . . There were well marked entrances of the exterior vestibule type. The floor of the vestibule was on a level with the land surface. Although the exact construction of the entrance could not be determined, the walls were evidenced by narrow trenches. It seems probable that either small saplings or cane were set contiguously in the trenches and plastered on the outside. The fireplace, which was usually centrally located, consisted of a basin shaped depression in the floor around which was usually an elevated rim, both basin and rim being covered with a layer of puddled clay which was hardened by fire (Lewis and Kneberg 1941:7-8).

The burial custom represents their most unique cultural trait. The dead were most commonly placed in well-made oblong flat-bottomed graves which were closely associated with their dwellings. The burials were fully extended on their backs, and some individuals seem to have been covered with logs or bark; in a few cases the graves were lined with limestone slabs. Infants were occasionally covered with large pottery fragments. Mortuary furniture was relatively scarce with such articles as celts and ceramic vessels rarely represented. The majority of the grave goods were in the form of beads and hairpins and other artifacts associated with wearing apparel (Lewis and Kneberg 1941:8).

In general, the pottery was the most abundant cultural remains of the Mouse Creek people and consisted largely of a coarse, shell-tempered ware. Both jars and bowls of roughly smoothed plain ware prevailed. Jars usually exhibited flat straplike handles or lugs, and the bowls were shallow, frequently with flaring rims and some with spouts. Salt pans among the Mouse Creek people were usually plain, with fabric-impressed pans occurring occasionally. Water bottles with both the open short neck and "blank face effigy" are represented (Lewis and Kneberg 1941:8).

A further possible clue to the origin of the Mouse Creek people appears in the form of small, crudely made ceramic toys or totems. Lewis and Kneberg (1955:79) note that these small zoomorphic figurines were made by the men as they told stories; ". . . the story teller dramatized his tale with the figurines and then gave them to the children for playthings." They further remark that these items were still being made by Yuchi men in Oklahoma as late as 1908. "They have also been found in old towns in Middle Tennessee where the Yuchi may have lived before moving into the eastern part of the State" (Lewis and Kneberg 1955:79). Similar ceramic figurines from the Arnold site in Middle Tennessee are also described by Ferguson (1972:43-45).

These Mouse Creek or Yuchi people were said by Lewis and Kneberg (1941:11) to have first settled in the East Tennessee area about 1540 A.D. Settlement in this area may have been encouraged by the Creek (Dallas), for the Creek and their neighbors the Cherokee were traditionally hostile toward one another. Fighting and sudden raids between the two were relatively common occurrences; thus, "By using the Yuchi province as a buffer state, the Creeks could better protect their own towns" (Lewis and Kneberg 1955:76).

The occupation of the Mouse Creek sites is considered to have extended into the early historic period. Lewis and Kneberg (1941:7) support this assumption by evidence from the Hampton site at which ". . . some articles of white manufacture . . . [and] well preserved pine logs, still containing some of the resin. . . ." were found. Garrow (1975:80) further notes that the ". . . number of multiple burials present at northern and southern Mouse Creek sites may reflect the intrusion of European disease and merely reinforces the late date for this phase." According to Lewis and Kneberg (1955), this occupation ended in 1714 when a local trader, Alexander Long, for revenge, enticed the Cherokee to make war on the Yuchi town of Chestowee. The attack was sudden and fierce, and the town and all of its inhabitants were destroyed. "The sudden disaster which befell the town of Chestowee and the ever-present threat of the Cherokee caused the rest of the Yuchi to abandon eastern Tennessee" (Lewis and Kneberg 1955:76).

A second possible area, other than the Middle Cumberland Valley, for the origin of the Mouse Creek people has been suggested by Garrow (1975). Garrow (1975:81-82) indicates that the sites in the Carter's Dam area in Murray County, Georgia, characterize the Mouse Creek phase to a greater degree than does either the Hiwassee River sites of Tennessee or the King site of Georgia. Two Carter's Dam sites, Bell Field and Little Egypt, are extremely significant in that both contain mounds which ". . . were in use, and were expanded during the Mouse Creek occupation" (1975:82). The presence of mounds at these sites is suggestive of a long period of occupation. Garrow (1975:83) states that "It is premature to explore the cultural roots of the Mouse Creek phase at this time, although Kelly's work (n.d.) at Bell Field has indicated that the Mouse Creek architectural type developed in the Ridge and Valley region of Georgia over a long time span."

The Dallas Phase

The Dallas phase represents one of the major cultural manifestations of the eastern Tennessee Valley during Middle Mississippian times. Lewis and Kneberg (1941:12) see the community plan, architecture, burial customs, and ceramics as cultural traits which most clearly differentiate the Dallas phase from the nearby Mouse Creek phase.

Lewis and Kneberg (1941:12) describe the community plan as being one ". . . of the compact, stockaded village type with the dwelling houses adjacent to a prominently located community center." They further note that the council houses were commonly built upon foundations which were elevated above the surrounding land surface. Lewis and Kneberg contrast this with the open court village and absence of mounds found at Mouse Creek sites. However, Garrow (1975:77) suggests that "it is more likely that the lack of mounds in the Mouse Creek communities reflected the frontier position of those villages, and did not indicate a definitive trait of the Mouse Creek Phase as a whole."

Dallas architecture contrasts to that of the Mouse Creek in that neither the subsurface floor nor the vestibule entrance was employed. The only exception to this appears at the Dallas site; here two vestibule entrances to a most elaborately constructed community house are found (Lewis and Kneberg 1941:13).

The Dallas and Mouse Creek phases also differ when their respective mortuary practices are compared. Lewis and Kneberg (1941:13) describe the Dallas as usually burying their dead

> . . . around the house or in the sides or summits of the substructure mounds. The bodies were always laid in a flexed position with the legs bent at the knees and hips and usually the arms bent at the elbows. . . . Occasionally the bodies were wrapped in twilled cane matting or protected with covers of wood or bark. Stone lined graves were used by the Dallas people but the scarcity of suitable flat slabs of limestone in the immediate vicinity of the settlements may account for the fact that this type of grave was not more prevalent.

Also, more grave goods and artifacts of finer quality were believed to be interred with Dallas than with the Mouse Creek people (Lewis and Kneberg 1941:13). However, Garrow (1975:80) feels that "the scarcity of grave goods noted for the northern Mouse Creek sites probably reflects the village nature of those sites and the relatively small amount of area excavated." The Dallas grave goods, like the Mouse Creek, consisted of articles associated with the costume or clothing of the deceased but may differ in that more items of domestic use were found.

The domestic ceramics of the Dallas, in terms of tempering and clay, diverge little from that of the Mouse Creek, and the type of decorations and designs varied only slightly between the two groups.

> One of the characteristics of Dallas pottery which most clearly differentiates it from Mouse Creeks pottery is the frequency with which the exterior surfaces were finished with cord marking. Another important contrast is in the exclusive use of the fabric marked surface on salt pans (Lewis and Kneberg 1941:14).

The Middle Cumberland Culture

The Middle Cumberland culture is situated along the Cumberland River in Middle Tennessee with its center in the Nashville area. This culture has been popularly called "Stone Box Grave" culture because of their almost exclusive use of stone slab coffins for the burial of the dead. Hanson (1960) believes that this area is the place of origin of the stone-grave mortuary trait. He (1960:78) sees evidence for this conclusion in the fact ". . . that the greatest number of sites, stone graves and stone graves per site are in this zone." Radiocarbon dates (see Table I) from sites within this area suggest a time range of from about 1000 A.D. to 1400 A.D. or possibly later.

These sites represent a curiosity which has stimulated both imagination and interest for almost a century. Some of the earlier archaeologists who worked in this area include Putnam (1878), Thurston (1897), and Myer (1928a). Although excavation and speculation concerning the "Stone Box" people have been going on since the late 1800's, the Middle Cumberland culture remains largely as a little-known facet of southeastern prehistory.

Few details of the community plan of the Middle Cumberland culture are presently known. According to Hanson (1960:77), the villages were stockaded and enclosed a plaza area and temple mounds with the cemeteries usually separate from this area. Haywood (1915:109) makes mention of these stockades in his description of the area in 1779-80 as viewed by the first settlers.

> At many springs is the appearance of walls inclosing [sic] ancient habitations, the foundations of which were visible wherever the earth was cleared and cultivated, to which walls intrenchments [sic] were sometimes added. These walls sometimes inclose six, eight, or ten acres of land; and sometimes they are more extensive.

Myer (1928a:549-550) notes that archaeological evidence for such structures appear at the Gordon Town site, in Davidson County, Tennessee. Putnam (1878:204-206) also sees the

TABLE I

RADIOCARBON DATES FROM
MIDDLE CUMBERLAND SITES

Site Number	Site Name	Sample Number	Carbon Date	Date	Source
40DV12	West	UGa 333	590 ± 115 B.P.	1360 A.D.	Dowd (1975, personal communication)
40DV15	Ganier	GX 0871	700 ± 80 B.P.	1250 A.D.	Ferguson (1972)
40WM5	Arnold	GX 1079	750 ± 80 B.P.	1200 A.D.	Ferguson (1972)
	Arnold	GX 0452	270 ± 65 B.P.	1680 A.D.	Ferguson (1972)
40WI1*	Sellars Farm	UGa 947	975 ± 235 B.P.	986 A.D.	Butler (1975, personal communication)

*Three other C^{14} dates were obtained from this site with the latest dating to 1236 A.D.

stockaded village with temple mounds as a characteristic of this group.

Substantial evidence for the type of architecture employed by these people is limited. Putnam (1878) excavated 19 houses at the Greenwood site in Wilson County, Tennessee. These houses appeared on the surface as a ring or ridge of earth. Putnam (1878:349) notes that ". . . the ridges were formed by the decay of the walls of a circular dwelling. . . . ." He provides only the surface appearance as evidence for the shape of the houses. Myer (1928a:545) describes house circle 42 at the Gordon Town site as a ". . . saucerlike depression . . . 18 inches below the rim of the circle . . . . Near the center of the circle was a fire bowl. . . . . ." In a more recent salvage excavation of the Arnold site, none of the houses were uncovered in their entirety.

> No wall lines were fully excavated . . . . The saucer-shaped depressions appeared to be round or nearly so. However, centuries of erosion may account for the circular appearance" (Ferguson 1972:14).

House 3 at the Ganier site varies from the above in that it ". . . was sixteen feet in diameter and postmolds suggested a square wall pattern" (Broster 1972:58). Circular surface features are not necessarily indicative of a circular structure, for Nash (1968) excavated similar surface features, though probably not Middle Cumberland, in Humphreys County, Tennessee, which yielded square houses.

A large number of Middle Cumberland burials have been unearthed in the past. Thurston (1897:2) reports that he had uncovered over 3000 burials at the Noel site near Nashville and a nearby site contained another 1000. Putnam was reported to have dug approximately 6000 stone graves (Thurston 1897:28). Skeletal material was at this time attributed much less importance than the cultural remains. As an unfortunate result, only a comparatively small amount of human skeletal material from Middle Cumberland burials remains today for study.

The Middle Cumberland mortuary practice is characterized by graves which have been lined with stone slabs; limestone was most commonly used because of its slablike form and availability in the area. These stone graves seemed to have been tailored for the deceased, who were usually buried fully extended. Both single and multiple burials are also found, and graves were frequently reopened and reused.

Concerning ceramics, the Ganier site exhibits four Mississippian types. "Neeley's Ferry Plain (Mississippian Plain) and Bell Plain . . . were most abundant. Salt Pan Plain and Fabric Impressed sherds occurred in much smaller frequencies" (Broster 1972:59). Broster (1972:59) further notes that the forms of Bell Plain pottery found with the burials ". . . can be closely identified with the Dallas decorated vessels described by Lewis and Kneberg (1946)." The most common vessel form was that of a large jar with lug handles, and strap handles occurred to a lesser extent. Many of the common Middle Cumberland ceramic types are illustrated in Dowd (1972).

From the radiocarbon dates (see Table I) it can be seen that the Middle Cumberland culture extends back in time to as early as 1000 A.D. But of particular interest here is the date at which this culture ended in the Middle Tennessee area. If the second radiocarbon date from the Arnold site is acceptable, Middle Cumberland occupation in this area may have continued into the early eighteenth century. However, the ethnohistoric record seems to suggest an earlier date for their disappearance. In the late 1600's the Charleston trading company, in search of more Indian tribes with which to trade, explored lands west of the southern Appalachians; in this exploration, no mention was made of villages or people (Ferguson 1972:3). From the large number of Middle Cumberland burials removed by Putnam and others, no report has been made of European trade goods. Putnam (1878), from his work, concluded that there had been no white contact.

During Mississippian times the Middle Cumberland Valley supported a very large population, as is evident from the number of burials removed. However, by the time the first Europeans began to explore the area, these peoples had vanished. A variety of explanations (e.g. epidemic diseases, pressure from other Indian groups, etc.) have been offered (Ferguson 1972:45) for this abandonment, but no substantial conclusion has yet been made. However, it may be inferred that this population, at least in part, moved into the eastern Tennessee Valley.

Summary

Lewis and Kneberg suggest that the Mouse Creek people (who they believed to be antecedent to the historic Yuchi) moved into the eastern Tennessee Valley from Middle Tennessee sometime after 1540 A.D. and settled between the Dallas or historic Creek and the Cherokee. The Mouse Creek or Yuchi acted as a buffer state between the Creek and the Cherokee. This settlement lasted only a short time, for in 1714 they were forced out of East Tennessee by the Cherokee.

The above represents a brief archaeological and ethnohistoric description of the Mouse Creek, Dallas, and Middle Cumberland cultures--three roughly contemporaneous populations. These populations exhibit four major cultural traits--settlement pattern, architecture, mortuary practices, and ceramics--which were deemed important by Lewis and Kneberg as differentiating the Mouse Creek culture from the Dallas and relating it to that of the Middle Cumberland. Of these four, the settlement pattern, architecture, and mortuary practices of the Mouse Creek people strongly differ from those of the Dallas.

Mouse Creek settlements were composed of stockaded villages with closely grouped dwellings arranged in an orderly manner around a central open court. This open court is not typical of Dallas villages; however, it is suggested for the Middle Cumberland culture by the early archaeological excavations of the Nashville area.

Mounds were present at both the Dallas and Middle Cumberland sites but were absent at Mouse Creek. Lewis and Kneberg view this absence as indicative of the relatively short time span at which the Mouse Creek sites were inhabited.

Mouse Creek houses also differed from those of the Dallas in that they were described as having subsurface floors with exterior vestibules. The Dallas houses were, with extremely few exceptions, without these features. To the author's knowledge, no reference has been made in the archaeological literature of the Middle Cumberland area to the presence of exterior vestibules, but dwellings with subsurface floors may be suggested by the presence of "saucer shaped" circular ridges of earth which appear on the surface and mark the location of Middle Cumberland houses.

The mortuary practice of the Mouse Creek people strongly complements that of the Middle Cumberland, while it contrasts to that of the Dallas. Both Mouse Creek and Middle Cumberland people buried their dead fully extended (however, Middle Cumberland buried their dead in stone-lined graves--a factor probably prompted by the availability of limestone in the Nashville area). On the other hand, the Dallas were buried fully flexed. The Dallas were also buried with more and finer-quality grave goods than those found with the Mouse Creek.

Ceramics only hint at differences between the Mouse Creek and the Dallas. The ceramics of the Dallas differ from the Mouse Creek in frequent use of cord marking on the exterior surface and the use of fabric-marked surfaces on salt pans. The exterior surface of Mouse Creek salt pans was usually plain. The possible relationship between the Mouse Creek and the Middle Cumberland cultures is further suggested by the presence of crudely made ceramic figurines which appear at both Mouse Creek and Middle Cumberland sites.

Sound archaeological data from the Middle Cumberland area plus additional radiocarbon dates for all three groups are necessary if their cultural relationships are to be more clearly defined.

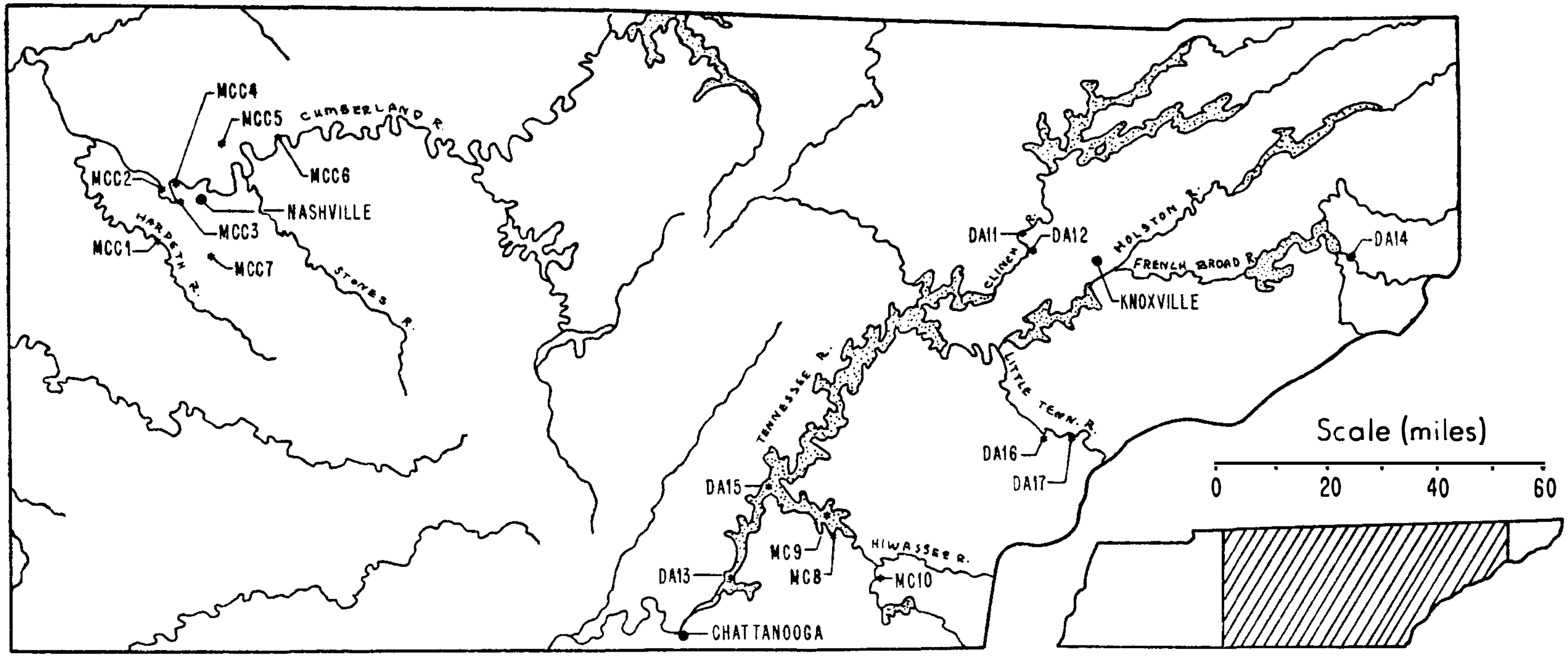
CHAPTER III

DESCRIPTION OF MATERIAL

Metric techniques have been employed extensively in the past by which to ascertain the biological relationship or distance between human skeletal populations. Although such techniques have been applied to both cranial and postcranial material (Van Vark 1970) with equal success, craniometry, the more traditional approach, was utilized in this study.

A series of measurements was made on crania representing three culturally defined groups--the Mouse Creek, the Dallas, and the Middle Cumberland cultures. Each of these groups is represented on a number of sites which are distributed throughout Middle and East Tennessee (Figure 1). These sites and the skeletal material available from each are discussed in the following pages of this chapter and presented in Table II.

In general, the Mouse Creek people lived along the Hiwassee and Ocoee rivers in what is now Bradley County and Polk County in East Tennessee. The burials taken from these sites are characterized by their extended position. This, as previously discussed, is one of the main traits which differentiate the Mouse Creek people from nearby Dallas groups situated along the Tennessee River and its tributaries in East Tennessee. The third group, the Middle Cumberland or "Stone Box" people, was located along the Cumberland and Harpeth rivers in Middle Tennessee with most of the sites concentrated in the Nashville area.



Middle Cumberland Culture		Mouse Creek Phase		Dallas Phase	
MCC1	40DV2	MC8	40BY11	DA11	40AN15
MCC2	40DV12			DA12	40AN19
MCC3	40DV15			DA13	40HA1
MCC4	40DV36	MC9	40BY13	DA14	40JE1
MCC5	40DV54			DA15	40MG31
MCC6	40SU3			DA16	40MR5
MCC7	40WM5	MC10	40PK1	DA17	40MR7

Figure 1. Distribution of sites in Middle and East Tennessee.

TABLE II

CRANIA AS TO
CULTURE, SITE, AND SEX

Culture	Site: Name	Site: Number	Abbreviation	Males	Females	Total
Middle Cumberland	Herman	40DV2	MCC1	3	4	7
	West	40DV12	MCC2	0	1	1
	Ganier	40DV15	MCC3	1	4	5
	State Prison Farm	40DV36	MCC4	1	0	1
	Dailey	40DV54	MCC5	0	1	1
	Old Hickory Reservoir	40SU3	MCC6	1	0	1
	Arnold	40WM5	MCC7	17	9	26
TOTAL				23	19	42
Mouse Creek	Rymer	40(15)BY11*	MC8	10	12	22
	Ledford Island	40(16)BY13	MC9	4	10	14
	Ocoee	40(1)PK1	MC10	1	2	3
TOTAL				15	24	39
Dallas	Johnson Farm	40(2)AN15	DA11	1	3	4
	Cox	40(18)AN19	DA12	1	1	2
	Dallas	40(7,8)HA1	DA13	10	8	18
	Fain's Island	40(1)JE1	DA14	5	2	7
	Hiwassee Island	40(38,63,VT1)MG31	DA15	4	4	8
	Tomotley	40MR5	DA16	0	1	1
	Citico	40MR7	DA17	1	4	5
TOTAL				22	23	45

*The number or numbers which appear in parenthesis designate units within the site.

Most of the skeletal material used by the author was stored at the University of Tennessee, Knoxville. The skeletal material from four of the Middle Cumberland sites (40DV12, 40DV36, 40DV54, and 40SU3) was stored in the Osteology Lab of the Department of Anthropology, University of Tennessee. All of the Mouse Creek and Dallas skeletal material and the material from one Middle Cumberland site (40DV2) were housed at McClung Museum, University of Tennessee. The author was kindly permitted access to this material by Dr. Alfred Guthe. Dr. Ronald Spores from the Department of Anthropology, Vanderbilt University, allowed the author to measure the crania from two Middle Cumberland sites (40DV15 and 40WM5) stored there. The preservation of the majority of the skeletal material from these sites, as from other sites throughout the Southeast, can only be described as fair. Preservation and breakage greatly limited the number of measurable crania available from each site. With this problem it became necessary to reconstruct many of the skulls used; this was especially true for some of the Mouse Creek and Dallas skeletal material. Although the author reconstructed a large number of the damaged crania, several other skulls had been repaired a number of years earlier by Madeline Kneberg. Most of these reconstructed crania were deemed accurate and suitable for use in the present study. Many of the problems related to the measurement of damaged crania will be further explored in the following chapter.

The Middle Cumberland Culture

Herman Site (40DV2)

The Herman site, 40DV2, was first investigated by George Neumann in 1936. The site is situated in Davidson County, Tennessee, in a bend of the Harpeth River, east of Beech Bend and northwest of Hicks Bend. Construction of a house and a pond on this site was initially responsible for uncovering some 26 stone-box burials (Neumann 1936). Of these burials, the crania of three males and four females were measured by the author.

West Site (40DV12)

The West site lies on the east bank of the Cumberland River in Davidson County, Tennessee. The site is more specifically situated in Bell's Bend just opposite the point where Indian Creek flows into the Cumberland and at a distance of approximately 9 miles from Nashville. Excavation was carried on at this site by Mr. John T. Dowd and Mr. H. C. "Buddy" Brehm of Nashville and later reported on by Dowd (1972) in a monograph entitled *The West Site: A Stone Box Cemetery in Middle Tennessee*. In this publication Dowd reports on the removal of some 50 burials. Of these burials 31, or 62 percent, were submitted to Moira H.M. Wright, David C. Stout, and William M. Bass (1973:12-49) of the University of Tennessee for analysis. A radiocarbon date of 590 ± 115 years B.P. (1360 A.D.) was obtained from the Georgia Geochronological Laboratory at the University of

Georgia (Dowd 1975, personal communication). This date places the site well within the Mississippian period and is roughly contemporaneous with dates from nearby Ganier and Arnold sites. After the examination of the skeletal material by the author, the cranium from only one individual, a female, was deemed useful for the present study.

Ganier Site (40DV15)

The Ganier site represents a Mississippian village located in Davidson County, Tennessee, within the Nashville city limits. The site covers approximately 25 acres and is more specifically situated on the left bank of the Cumberland River approximately 500 feet south of Clee's Ferry Road. A radiocarbon date of 700 ± 95 years B.P. (1250 A.D.) was obtained, which leaves no doubt as to the cultural affiliation of the burials found here. Two other components, a Late Archaic and a Middle to Late Woodland, were also present at this site; however, neither contained burials (Broster 1972). The crania from a total of five burials, one male and four females, were utilized by the author.

State Prison Farm Site "C" (40DV36)

The site is located in Cockrill Bend on the flood plain of the Cumberland River in Davidson County, Tennessee. Six burials were salvaged from this site during 1971 and 1972 by Mr. John T. Dowd and Mr. John Broster, when they were disturbed by cultivation (Dowd 1975, personal communication).

The cranium from only one individual, a male, could be measured for this study.

Dailey Site (40DV54)

The Dailey site is a stone-box cemetery found in Davidson County, Tennessee, approximately 2 miles north of the Brick Church Pike Mound. Sixteen of these burials were removed during 1973 by Mr. John T. Dowd. Mr. Dowd notes that he has knowledge of at least six more burials which were removed at an earlier date from this site. The majority of these burials were in slate boxes and in very poor state of preservation. Due to this poor preservation, the cranium from only one female was utilized in the present study.

Old Hickory Reservoir Site (40SU3)

The Old Hickory Reservoir site is situated in Sumner County, Tennessee, on an island in the Old Hickory Reservoir. Excavation at this site was conducted by the University of Tennessee under the guidance of Dr. D. Bruce Dickson during June of 1973. During this time 35 stone-box burials were removed from the site (Banks 1975). Due to damage, only one male cranium was suitable for measurement.

Arnold Site (40WM5)

The Arnold site is located in northern Williamson County, Tennessee, approximately one mile southwest of Brentwood. This site was excavated between 1965 and 1966 by members of the Southeastern Indian Antiquities Survey, Inc., of Nashville. Two radiocarbon dates, based on the collagen content of human femora, were obtained and appear as follows:

1. 1200 A.D. (750 ± 80 years B.P.; GX 1079).
2. 1680 A.D. (270 ± 65 years B.P.; GX 0452) (Ferguson 1972:39-40).

Ferguson feels that the lack of European trade goods and the apparent abandonment of such sites in the Middle Tennessee area prior to historic contact renders the 1680 date less acceptable than the earlier date. The skeletal material from this site was in quite good condition; and a total of 26 individuals, composed of 17 males and 9 females, were measured.

The Mouse Creek Phase

Rymer Site (40BY11, Unit 15)

The Rymer site is located in Bradley County, Tennessee, on the left, or south, bank of the Hiwassee River one mile above the point where South Mouse Creek flows into it (Lewis and Kneberg 1939). The site was excavated from 1937 to 1938 by the University of Tennessee. During the excavation it was divided into four units (12, 13, 14, and 15); however, the present study was only concerned with the skeletal material from unit 15. Two components manifested themselves at this site. Component I was affiliated with the Late Woodland Hamilton phase while Component II, a Mississippian village area, was identified as Mouse Creek. Measurements from 10 male and 12 female crania were obtained from the Component II material.

Ledford Island Site (40BY13, Unit 16)

The Ledford Island site was excavated by the University of Tennessee between May 1938 and March 1939. The site is located in Bradley County, Tennessee, about 12 miles above the mouth of the Hiwassee River and 6 miles below Charleston, Tennessee, near the head of Ledford Island (Lewis and Kneberg 1939). Two components were found at this site. Component I represents the earlier Middle Woodland Candy Creek phase while Component II, the main occupation, consists largely of the Mouse Creek phase. Component II also exhibits some Dallas traits such as house type, flexed burials, and ceramics. Fourteen Mouse Creek crania, four male and ten female, were obtained for measurement from this site.

Ocoee Site (40PK1, Unit 1)

Excavations at Ocoee were conducted by the University of Tennessee between September and December of 1938. This site is located in Polk County, Tennessee, and is situated on the right, or east, bank of the Ocoee River approximately one mile above the point at which it empties into the Hiwassee River (Lewis and Kneberg 1939). Three components were identified at this site. Component I, the earliest, represents an extensive Candy Creek occupation while Component II, with which the author was concerned, consists of the later Mouse Creek phase. The last occupation, Component III, was that of an historic Cherokee group. Only three crania from Component II, one male and two female, were measurable.

The Dallas Phase

Johnson Farm Site (40AN15, Unit 2)

The Johnson Farm site is located on the south bank of the Clinch River in Anderson County, Tennessee, approximately 2-1/2 miles west of South Clinton. Excavations were first conducted at this site by the University of Tennessee in 1934 under the supervision of T. M. N. Lewis and H. M. Sullivan (Webb 1938). Eight burials and a number of Mississippian artifacts were recovered at this time. During July 1960, the University of Tennessee carried on a second excavation under the supervision of Dr. C. H. McNutt; the purpose of this work was to supplement the data obtained during the previous excavation. McNutt noted that the ceramics found at this site indicate the presence of both Woodland and Mississippian components. At the conclusion of the 1960 excavation, 19 burials had been recovered. The majority of these burials were flexed; and the mortuary items, though few in number, indicate that they were Dallas interments (McNutt and Fisher 1960). One male and three female crania were utilized.

Cox Site (40AN19, Unit 18)

The Cox site is located in Anderson County, Tennessee, and is situated on the east bank of the Clinch River just above Mile 47 (McNutt and Fisher 1960:65). Excavations were first carried on at this site during the Norris Basin investigations of the late 1930's, at which time a Dallas mound was investigated (Webb 1938). Excavations were later resumed by the University of Tennessee in 1960 and were continued into 1961 by interested members of the Tennessee Archaeological Society. During the 1960 work, evidence of both Woodland and late Mississippian occupation was found. From this excavation a total of 43 burials were removed. Two Dallas crania, one male and one female, were measurable.

Dallas Site (40HA1, Units 7 and 8)

The Dallas site is located on the east bank of the Tennessee River in Hamilton County, Tennessee. The site is situated 4 miles from Harrison, Tennessee, and extends from the Birchwood Road to the Tennessee River (Nash 1936). It was excavated under the direction of Charles Nash in 1936 and was divided into two units: (1) 7HA1, a village site, and (2) 8 HA1, a mound located in the south end of the village. A large number of Dallas burials were taken from this site. The crania from four males and one female from the village area and six males and seven females from the mound were utilized.

Fain's Island Site (40JE1, Unit 1)

Excavation was carried on at Fain's Island in 1934 by the University of Tennessee under the supervision of Thomas M. N. Lewis and Charles G. Wilder. The island is situated in the French Broad River near Dandridge in

Jefferson County, Tennessee. Although the site was occupied by a number of components, the Dallas occupation was the most intensive. Seven crania from this site were measurable, including five male and two female.

Hiwassee Island Site (40MG31, Units 38, 63, and VT1)

The excavation of Hiwassee Island was conducted from April 1937 through March 1939 by the University of Tennessee under the supervision of T. M. N. Lewis. The site is located in Meigs County, Tennessee, near the left bank of the Tennessee River at a point where the Hiwassee River empties into it. Hiwassee Island was found to have had three separate prehistoric occupations and one historic occupation. However, only Component III, the Dallas component, is of interest to this study. The crania of four males and four females were measured.

Tomotley Site (40MR5)

The Tomotley site is located in Monroe County, Tennessee, on the Little Tennessee River a short distance downstream from its confluence with Toqua Creek (Salo 1969:13). The University of Tennessee worked at this site in 1967 and later in 1973 and 1974. Both Mississippian and historic burials have been unearthed. However, only one Dallas female cranium could be utilized in the present study.

Citico Site (40MR7)

The Citico site is located on the west bank of the Little Tennessee River near the confluence of Citico Creek in

Monroe County, Tennessee. This large village was occupied by both a late prehistoric Dallas component and a historic Cherokee component (Salo 1969:26). Excavation at Citico was carried on from 1967 to 1968 by the University of Tennessee. During this time a total of 224 burials, mostly Dallas and Cherokee, were recovered. Much earlier, in the late 1800's, Cyrus Thomas also visited this site and reported finding 91 burials in the Citico mound (Salo 1969:26). Of the Dallas burials removed by the University of Tennessee, the crania of only one male and four females were of use to the author.

CHAPTER IV

STATISTICAL METHODS AND TECHNIQUES

Physical anthropology has traditionally been concerned with the biological relationship among human populations, both living and dead. Of growing importance in this field has been the application of metric and statistical methodologies as tools to more clearly define these biological relationships. The goal of this chapter is to review these methods and techniques, discuss their more recent applications, and introduce the metric and statistical procedures employed by the author in the present study.

Review of Statistical Methods Employed in Anthropology

In the past univariate analysis has been extensively used in extracting biological information from skeletal material. This method is limited in that it is only concerned with a one-to-one comparison of either singular measurements or the relationship of two measurements as expressed by an index. Howells (1969) discusses this method and the more recent multivariate analyses which have emerged as a superior approach by which to obtain this type of information. These multivariate methods

> . . . allow a skull to be treated as a unit, i.e., as a configuration of the information contained in all its measurements. Next, they allow populations to be treated as configurations of such units, taking account of their variation in shape because they in turn are handled as whole configurations of individual dimensions. Finally, the relations

> and differences between all the populations being considered are set forth in terms of their several individual multivariate ranges of variation (Howells 1973:3-4).

One of the first attempts at a more complex method than the univariate method was made by Czekanowski as early as 1909 and appeared in an article entitled "*Zur Differentialdiagnose des Neandertalgruppe*" (Czekanowski 1909). It was in this article that Czekanowski introduced "*durchschnittliche* differing" or DD. DD assumes that the biological difference between two populations or groups is represented by a combination of the different morphological traits or measurements. A number of objections have been raised against this procedure. Constandse-Westermann (1972:23) presents a few of these criticisms:

> The correlations between traits are not accounted for. There is no possibility of testing the significance of DD. Moreover, the statistical value of the index would be increased by taking the variances of the different traits into account whilst allowing for the discrepancy between "large" and "small" measurements.

Czekanowski, in an attempt to answer certain of these criticisms, made revisions of this procedure in 1932. One of Czekanowski's major critics was Karl Pearson, who in the early 1900's developed his own coefficient of distance.

Pearson's (1926) approach, the coefficient of racial likeness (C.R.L.), was already being applied by a number of his colleagues prior to its formal introduction in 1926. This method was extensively used during the first part of this century. Morant (1922-23:205) describes the C.R.L. as representing ". . . a measure of two [groups compared] being random samples from the same population." The C.R.L. was the first method to express the means and differences in standard deviation units. Pearson (1928) later revised the C.R.L., producing the coefficient of racial likeness reduced (C.R.L.R.), in order to guarantee better comparability between C.R.L. values. Statistically the C.R.L. is an improvement over Czekanowski's DD, although Czekanowski (1932) has shown that the correlation between these two approaches is quite high. However, a number of criticisms have been launched against this method (Fisher 1936; Seltzer 1937), the most valid of which centers on its failure to take into consideration the correlation between the variables used.

This criticism to the C.R.L. stimulated P. C. Mahalanobis (1936) to develop a more precise method for determining the morphological distance between populations. This method is known as Mahalanobis' Generalized Distance, or D^2, which is statistically more advanced than C.R.L. in that it takes into account the correlation between the various traits. However, this method was handicapped by the complexity inherent in its computation. Hand calculation of D^2 using three or more variables is extremely difficult, for it involves the inversion of a matrix composed of rows and columns which correspond in number to the number of variables employed. Rao (1952) introduced a method by which this problem of matrix inversion was by-passed, thus reducing much of the previously required computation. A brief and simplified summary of D^2 has been given by Rightmire (1969). However, D^2 was brought to bear on relatively few problems prior to the introduction of electronic computers.

In light of the computational problems of D^2, Penrose (1954) returned to the C.R.L. from which he devised a distance coefficient and designated it C_H^2. In this approach, if there is no correlation between the variables (p) being considered, then pC_H^2 is equivalent to D^2. "So C_H^2 is simply the mean sum of squared, 'standardized' differences between two populations concerning all observed traits" (Constandse-Westermann 1972:35). Several researchers (Penrose 1954; Huizinga 1965; Van Vark 1970; Rightmire 1970a; Jantz 1972; Corruccini 1973) have compared the results of C_H^2 with that of D^2, and each found a high correlation. This indicates that excessive errors will not result from ignoring the correlation between variables. Penrose (1954) further divided C_H^2 into size (C_Q^2) and shape (C_Z^2) components and also considers the average intercorrelation (R) among variables. Thus, Penrose produced a new value (C_R^2) from C_H^2. Penrose's approach has been extensively applied in anthropology over the past 20 years.

Since 1936, when Fisher introduced the discriminant function, multivariate statistical analyses have been applied to the study of human skeletal populations with greater regularity. Its growing applicability is due to the more recent accessibility of electronic computers to researchers. Kowalski (1972:119) notes that ". . . it is now commonplace for physical anthropologists to employ highly sophisticated methods of multivariate statistical analysis in an attempt to gain some insight into morphology, function, heritability, classification, discrimination and growth." Wright (1974: 14-15) has identified three general ways in which researchers have utilized multiple discriminant analysis as related to human skeletal studies. These are: "(1) the classification of individuals into known populations . . . ; (2) the determination of distances among populations of major ethnic groups . . . ; (3) the estimation of relationships among closely related populations in space or through time. . . ."

The first of these is demonstrated by a Giles and Elliot (1962) study in which a discriminant function analysis was employed. By this method, crania of unknown racial identity could be placed into one of three major groups--American white, American Negro, or American Indian. Number 2 above is best exemplified in studies by Rightmire (1970b), in which findings were made which brought clarity to the racial affinities of certain South African groups, and Howells (1973), who examined the biological distance among 17 modern world populations. Earlier studies by Howells (1966) and Crichton (1966) also applied multivariate analysis to this end. Number 3 is composed of studies from which archaeological inferences concerning population origins, movements, relationships, and changes through time have been drawn. Multivariate studies which best fit this category are those by Giles and Bleibtreu (1961), Hanna (1962), Bass (1964), and Jantz (1970; 1972; 1973; 1974). The goal of the present study is similar to these in that it seeks to examine the biological relationship of three archaeologically defined groups in Tennessee.

Metric Data

All of the crania used in the study were measured by the author; and, as with much of the skeletal material in the Southeast, poor preservation and breakage was a problem. It was necessary to reconstruct a number of crania and repair the majority. Breakage which could not be repaired or skulls which exhibited extreme warping from ground pressure presented further problems. Missing data produced by these two factors were, if at all possible, obtained through estimation as advised by Howells (1973). Howells (1973:34) states: "The best estimate, to my mind, in the great body of cases is likely to be a careful guess in the presence of the skull itself, using instruments in any possible way to make the estimate." About midway through the data gathering, the author remeasured approximately the first 20 crania as a means by which to check his own accuracy. Practically all of the measurements fell within a millimeter of those first taken, with the estimated measurements expressing a small amount of variability, but not enough for great concern. For badly broken or badly warped skulls, where estimation of particular measurements were deemed too inaccurate, the mean value based on the other crania--according to sex--from that site was substituted for the missing measurement. According to Jantz (1975, personal communication), this will act to reduce the variance; however, the author feels that this is not to such a degree as to greatly affect the results.

Initially, 33 measurements were made on each skull; the majority of these measurements were taken in accord with techniques prescribed by Bass (1971) or Howells (1973). Three osteometric instruments were employed--the sliding caliper, the spreading caliper, and the Western Reserve Head Spanner. Most of the skulls used exhibited either frontal or occipital deformation, thus presenting a culturally induced factor as a potential influence of the biological information expressed by the measurements. Giles and Bleibtreu (1961:51) note that ". . . deformation is not a significant variable in the individual facial measurements, . . . [but is a] significant variable in the case of cranial length, breadth, and height." For this reason 3 of the original 33 measurements, cranial length, breadth, and height, were judged invalid.

The concern that other measurements might be altered by frontal deformation prompted the author to further investigation. This was accomplished by dividing the crania of each of the three populations into two groups--frontal deformed versus occipital and nondeformed. This division was based on the fact that most of the measurements were from the facial region and it was assumed that occipital deformation would have little or no effect on this area. Each of the 30 remaining measurements were then compared between these two groups using the facilities at the University of Tennessee Computer Center and the T-TEST program from the *Statistical Package for the Social Sciences* (Nie et al. 1970). The results were examined, and the following seven measurements differed at the 0.05 level of significance: minimum frontal breadth, bizygomatic breadth, biorbital breadth, bistephanic breadth, basion-porion height, basion-bregma, and porion-bregma. The nasion-gnathion measurement closely approached this 0.05 level. It was assumed that these eight measurements were affected by frontal deformation, so they were deleted from the study. However, the author is aware that factors other than deformation--such as social stratification--may be responsible for these differences. The author also realizes that if the differences in the above measurements are the result of deformation, then other measurements may also be affected in ways in which the T-TEST program could not identify. Hopefully, more sophisticated tests will be developed and employed for this purpose in the future.

Twenty-two measurements were utilized in this study. These measurements, their abbreviations, anatomical landmarks, and the source which best describes each measuring technique are listed below:

1. Basion-nasion length (BNL). "Direct length between nasion and basion" (Howells 1973:171).

2. Basion-prosthion length (BPL). "The facial length from prosthion to basion . . ." (Howells 1973:174).
3. Maximum frontal breadth (MFB). "The maximum breadth at the coronal suture, perpendicular to the median plane" (Howells 1973:172).
4. Basion-gnathion (BG). With the dentition of the mandible and maxilla occluded, it is the distance from basion to gnathion.
5. Nasal height (NH). "From nasion to nasospinale" (Bass 1971:68).
6. Nasal breadth (NB). "From alare to alare" (Bass 1971:68).
7. Nasion-prosthion height (NPH). "Upper facial height from nasion to prosthion . . ." (Howells 1973:174).
8. Orbital height (OH). "The maximum height from the upper to the lower orbital borders perpendicular to the horizontal axis of the orbit and using the middle of the inferior border as a fixed point" (Bass 1971:69).
10. Interorbital breadth (IOB). "The breadth across the nasal space from dacryon to dacryon" (Howells 1973:178).
11. Cheek height (CH). "The minimum distance, in any direction, from the lower border of the orbit to the lower margin of the maxilla, mesial to the masseter attachment, on the left side" (Howells 1973:180).

12. Maxillo-alveolar length (MAL). "From prosthion to alveolon" (Bass 1971:70).
13. Maxillo-alveolar breadth (MAB). "From ectomolare to ectomolare . . ." (Bass 1971:70).
14. Mastoid height (MH). "The length of the mastoid process below, and perpendicular to, the eye-ear plane, in the vertical plane" (Howells 1973:176).
15. Mastoid width (MW). "Width of the mastoid process at its base, through its transverse axis" (Howells 1973:177).
16. Biauricular breadth (BAB). "The least exterior breadth across the roots of the zygomatic processes, wherever found" (Howells 1973:173).
17. Bimaxillary breadth (BMB). "The breadth across the maxillae, from one zygomaxillare anterior to the other" (Howells 1973:177).
18. Porion-glabella (PG). From biporion to glabella.
19. Porion-nasion (PN). From biporion to nasion.
20. Porion-subnasale (PSN). From biporion to subnasale.
21. Porion-prosthion (PP). From biporion to prosthion.
22. Porion-gnathion (PGN). From biporion to gnathion.

Measurements 18-22 required the use of a Western Reserve Head Spanner.

Only the crania from adult individuals were selected for measurement. Although the majority of these burials had been sexed by previous investigators, the author reexamined them in accordance with methods prescribed by McKern and Stewart (1957) and Bass (1971). The sex of only a few individuals was changed.

Statistical Procedure

Of the statistical methods discussed above, Mahalanobis' Generalized Distance or D^2 (Mahalanobis 1936), as elaborated by Goodman (1972), was judged the most appropriate for this study. Its most appealing aspect is its consideration of the correlation between the various traits used. It is true that Penrose (1954), in his method modified from Pearson's C.R.L., also takes this among-variable correlation into consideration. "With Penrose's formula, only a general correction is made for the correlation between the measures. Unlike the D^2-method, however, the measures are not weighted . . . . [With Penrose's size and shape] we do not obtain the best possible separation between the populations to be compared" (Van Vark 1970:78). Van Vark (1970:80-81) further mentions two other favorable characteristics of D^2:

> a. Only the D^2-method offers a starting-point for testing in a well-founded way the null-hypothesis that two samples have been drawn from the same population . . . .
>
> b. D^2 is a distance-measure depending far less on the accidental selection of measures than other distance measures. Thus, in contrast with the other measures, D^2 will not change if, for instance, instead of the measures X_1, X_2, . . ., X_p we choose X_1, $X_1 + X_2$, . . ., $X_1 + X_p$.

In order to derive the D^2 values for this study, the raw data (22 variables) were placed on computer punch cards. These variables were then subjected to the PEARSON CORR program (Nie et al. 1970), which produced a correlation matrix. Latent roots and vectors were extracted from this matrix with the program LATENT (Davies 1971). Principal components were then computed as products of the latent vectors and vectors of the mean values for each population. The D^2 values were then calculated from principal components using Goodman's (1972) formula, which appears as follows:

$$D^2_{ij} = \Sigma(y_{ik} - y_{jk})^2/\lambda_k$$

where y_{ik} is the kth principal component in population i, and λ_k is the corresponding latent root of the correlation matrix.

A singular or near singular covariance matrix is a problem in calculating D^2 from highly correlated variables. Singularity results from one character having complete linear dependence on one or more of the other characters in the study. This introduces a degree of error in the resulting distances obtained. Goodman's (1972) formula bypasses this problem without losing much of the information expressed by the variables. If all of the principal components are used in this method, the resulting D^2 values will be equivalent to those produced by Mahalanobis' formula. However, when correlated characters exist, it is desirable to use some, but not all, of the principal components. Goodman (1972:176) suggests using only those principal components for which the latent roots were 1.00 or larger.

This was followed in the present study, and eight latent roots for males and six for females were used.

Upon deriving the D^2 values for this study, they were each tested for significance using the Hotelling T^2 method as explained in the following manner: $T^2 = D^2(n_1 \cdot n_2/n_1 + n_2)$, and a Chi Square table was consulted to ascertain the significance. For this table, the degrees of freedom equal the number of variables (components).

The distance was further analyzed from the raw D^2 values by Gower's (1972) principal coordinates analysis, which places each site as a point in a multivariate space. In this study, the individual sites are represented in a three-dimensional space. The coordinates for each population or site are obtained through a series of transformations. Gower (1972:11) defines these transformations as follows:

> 1. Define a matrix E with elements $-\frac{1}{2}d^2_{jk}$.
> 2. Writing $e_{.k}$, $e_{j.}$, and $e_{..}$ for the row, column, and general means of E, evaluate a new matrix F whose elements f_{jk} are
> $$e_{jk} - e_{j.} - e_{.k} + e_{..}.$$
> 3. Find the latent roots and vectors (Λ and X) of F. Thus
> $$FX = X\Lambda.$$
> 4. Scale the columns of X, so that the sum of squares of the ith column is λi, the ith largest latent root. Thus
> $$X'X = \Lambda \text{ and } XX' = F.$$
> Then the elements of the ith row of X are the required coordinates of P_i... [of the ith population].

Hiernaux (1972), in a study of living sub-Saharan populations in Africa, successfully demonstrates the use of this method.

Thus the three major groups were subdivided into their various sites, and the same procedure as described above was applied. The raw D^2 values from each site individually, as well as the three major groups, were adjusted to compensate for differences in sample size (Rightmire 1969:159).

All of the above computations were achieved with the aid of the facilities at the University of Tennessee Computer Center. The results and their interpretation are presented in the following chapter.

CHAPTER V

ANALYSIS OF DATA

The hypothesis tested by this study may be paraphrased as follows: The Mouse Creek people were culturally separated from the Dallas, their nearest contemporary neighbors. The same cultural traits which separate them from the Dallas tend to align them with the Middle Cumberland people. The Mouse Creek phase may actually be indicative of a movement of these Middle Tennessee people into the eastern Tennessee Valley, perhaps during the second half of the sixteenth century. The cranial analysis is presented here as a test of this hypothesis. Also included in this analysis are certain peripheral interpretations concerning the relationships of the skeletal material among various individual sites.

Presentation of Distances

The mean values of the 22 measurements from the 3 cultural groups are presented in Table III. The raw D^2 values derived for the males and females from each of the three groups are presented in Table IV. These D^2 values are adjusted (as discussed in the previous chapter) for differences in sample size, and the relationship of these three groups is exhibited in Figures 2 (males) and 3 (females). Rightmire (1969:159) describes this method of graphic representation for three groups, and Jantz (1972:30)

TABLE III

MEAN CRANIAL MEASUREMENTS FOR MALES AND FEMALES

	Middle Cumberland Culture		Mouse Creek Phase		Dallas Phase	
	Males (n=23)	Females (n=19)	Males (n=15)	Females (n=24)	Males (n=22)	Females (n=23)
BNL*	102	96	99	97	103	99
BPL	99	94	97	97	99	95
MFB	124	119	127	122	124	119
BG	110	106	108	106	109	104
NH	52	50	52	50	54	50
NB	24	24	26	25	26	25
NPH	70	68	70	67	73	67
OH	34	34	35	35	36	36
OB	43	42	43	42	43	41
IOB	19	18	20	19	20	19
CH	25	23	26	24	25	23
MAL	54	53	53	53	55	51
MAB	68	64	66	64	68	65
MH	24	21	25	22	25	20
MW	13	12	14	12	14	12
BAB	131	126	134	127	129	123
BMB	102	99	102	98	102	97
PG	97	92	95	92	97	93
PN	91	85	90	86	92	87
PSN	92	87	89	86	90	87
PP	97	95	96	95	97	110
PGN	115	112	113	110	115	109

*See Chapter IV, pp. 42-44, for the abbreviations.

TABLE IV

RAW D^2 VALUES FOR BOTH MALES AND FEMALES

	MCC	MC	DA
MCC	0.000	0.759	1.865***
MC	1.593	0.000	1.325**
DA	1.762**	1.162	0.000

Note: Males are below the diagonal, females above.

*P < 0.05.

**P < 0.025.

***P < 0.01.

MCC--Middle Cumberland Culture.

MC --Mouse Creek Phase.

DA --Dallas Phase.

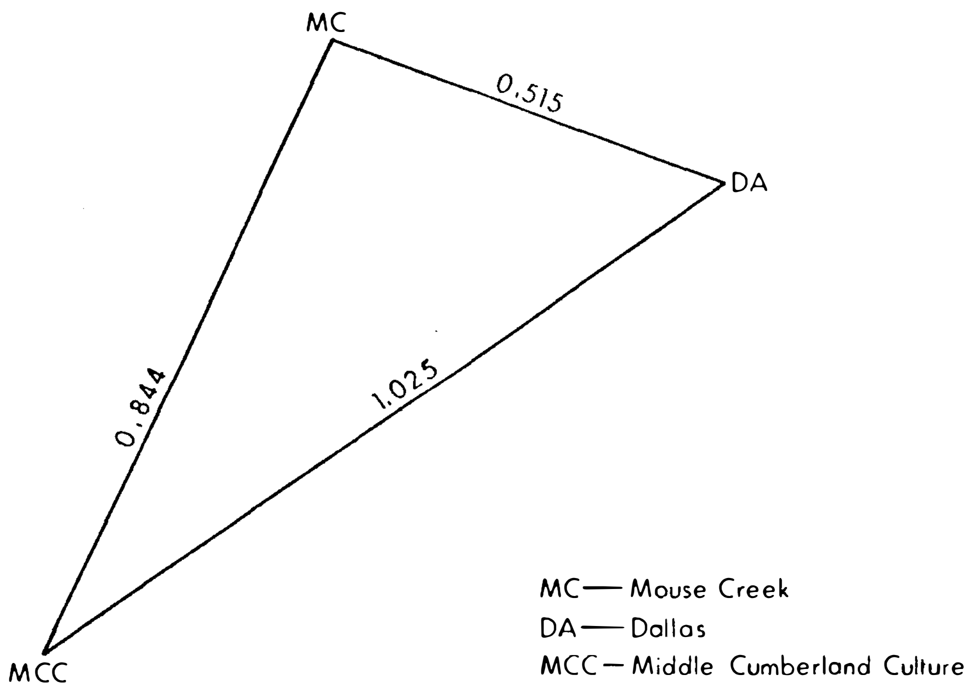


Figure 2. Diagrammatic representation of the males from the three cultural groups. These are expressed in D values as derived from the corrected D^2 values.

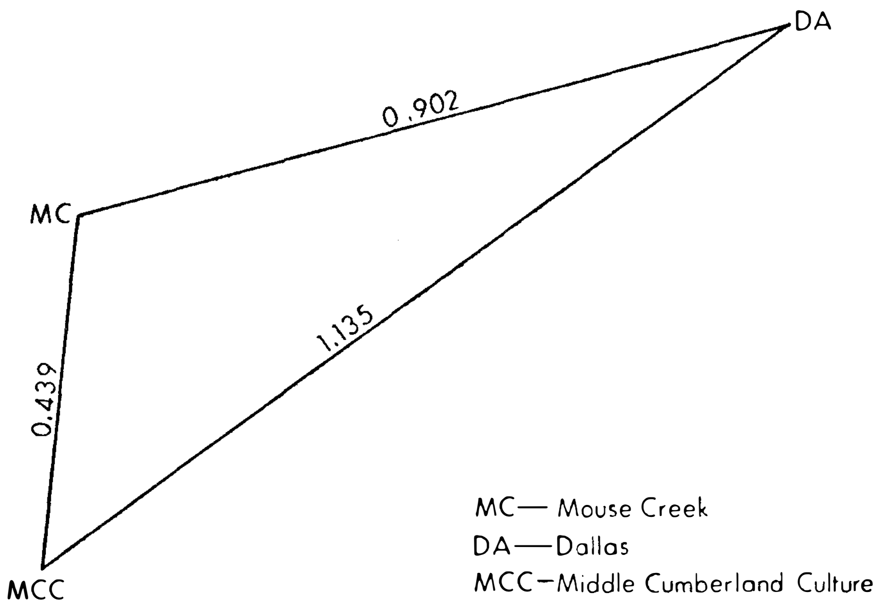


Figure 3. Diagrammatic representation of the females from the three cultural groups. These are expressed in D values as derived from the corrected D^2 values.

illustrates its application to more than three groups. To aid in interpretation, the three cultures are broken down into their individual sites, and the relationship of the skeletal material from Mouse Creek sites to that of each of the other sites is viewed. The corrected D^2 values for each of these sites are presented according to culture in Tables V, VI, and VII. Three-dimensional visual expressions of their morphological distances, as computed by Gower's principal coordinates analysis, are illustrated in Figures 4 (males) and 5 (females).

Interpretation of Distances Between the Three Cultures

The basic concern is the relationship of the Mouse Creek culture to the others; therefore, the null and alternate hypotheses may be stated as follows:

TABLE V

CORRECTED D^2 VALUES FOR MOUSE CREEK MALES AND FEMALES

Site PK1				Site BY11				Site BY13			
Males (n=1)		Females (n=2)		Males (n=10)		Females (n=12)		Males (n=4)		Females (n=10)	
MR7	0	DV12	0	MR7	0	DV54	0	MR7	0	DV54	0
SU3	0	MG31	0	DV36	0	DV12	0	DV36	0	DV2	0
AN19	0	BY11	0.008	PK1	0	JE1	0	MG31	0	DV12	0
AN15	0	DV54	0.049	DV15	0	PK1	0.008	HA1	0	MG31	0
DV15	0	BY13	0.692	SU3	0	MG31	0.812	JE1	0	WM5	0
BY11	0	JE1	1.331	JE1	0	DV2	0.949	SU3	0	JE1	0
JE1	0	MR5	1.451	BY13	0.486	BY13	0.961	PK1	0	PK1	0.692
HA1	0	DV2	1.881	AN19	0.757	WM5	1.404*	WM5	0	BY11	0.961
BY13	0	MR7	1.978	MG31	0.805	HA1	2.272***	BY11	0.486	AN19	1.325
DV36	0	WM5	3.078	WM5	1.064	AN19	2.547	DV2	1.055	MR7	1.982
WM5	2.087	DV15	3.411	HA1	1.231	MR7	2.763*	DV15	1.306	DV15	2.290
DV2	2.129	HA1	3.526	AN15	1.828	AN15	2.838*	AN19	2.979	HA1	1.617*
MG31	2.464	AN15	3.628	DV2	3.981*	DV15	3.474**	AN15	3.735	AN15	5.299***
		AN19	10.615*			MR5	8.242*			MR5	5.458

*P < 0.05.
**P < 0.025.
***P < 0.01.

TABLE VI

CORRECTED D^2 VALUES FOR DALLAS MALES AND FEMALES

Site	Males		Females		Site	Males		Females		Site	Females	
JE1	(n=5)		(n=2)		AN15	(n=1)		(n=3)		MR5	(n=1)	
	MR7	0	DV54	0		AN19	0	DV12	0.510		PK1	1.451
	DV15	0	AN19	0		PK1	0	HA1	0.837		WM5	4.829
	DV36	0	MG31	0		MR7	0	BY11	2.838*		MG31	5.158
	SU3	0	MR7	0		DV15	1.523	DV54	3.075		BY13	5.458
	PK1	0	WM5	0		SU3	1.703	DV2	3.282		DV2	7.207
	BY13	0	BY11	0		MG31	1.706	PK1	3.628		JE1	7.238
	MG31	0	BY13	0		HA1	1.730	BY13	5.299***		BY11	8.242*
	HA1	0	DV12	0.185		BY11	1.828	MR7	5.872**		DV12	8.262
	AN19	0	DV2	0.200		BY13	3.735	MG31	5.911**		DV54	8.877
	BY11	0	HA1	0.898		WM5	4.404	WM5	6.061***		AN19	12.770
	WM5	0.656	PK1	1.331		DV36	4.510	JE1	6.605*		HA1	13.336***
	DV2	2.815	DV15	6.049*		JE1	6.466	DV15	7.745***		MR7	14.098***
	AN15	6.466	AN15	6.605*		DV2	12.423*	AN19	11.072*		DV15	14.758***
			MR5	7.238				MR5	16.315***		AN15	16.315***
HA1	(n=10)		(n=8)		AN19	(n=1)		(n=1)				
	MR7	0	DV54	0		DV15	0	JE1	0			
	BY13	0	MR7	0.010		PK1	0	DV54	0			
	PK1	0	MG31	0.498		AN15	0	WM5	0			
	MG31	0	AN15	0.837		MR7	0	MG31	0.506			
	AN19	0	JE1	0.898		HA1	0	BY13	1.325			
	JE1	0	DV2	1.069		MG31	0	MR7	1.479			
	SU3	0	BY13	1.617*		JE1	0	DV2	1.566			
	DV15	0	WM5	1.706*		SU3	0	HA1	1.871			
	DV36	0.420	AN19	1.871		BY11	0.757	BY11	2.547			
	WM5	0.476	DV12	2.018		WM5	2.450	DV15	8.423*			
	BY11	1.231	BY11	2.272***		BY13	2.979	DV12	9.914			
	AN15	1.730	PK1	3.526		DV2	6.364	PK1	10.615*			
	DV2	3.401*	DV15	5.572***		DV36	7.204	AN15	11.072**			
			MR5	13.336***				MR5	12.770			

TABLE VI (continued)

Site	Males		Females		Site	Males		Females		Site	Females
MG31	(n=4)		(n=4)		MR7	(n=1)		(n=4)			
	DV36	0	DV54	0		DV15	0	JE1	0		
	BY13	0	JE1	0		PK1	0	MG31	0		
	HA1	0	BY13	0		DV36	0	DV54	0		
	JE1	0	MR7	0		BY11	0	HA1	0.010		
	WM5	0	WM5	0		BY13	0	DV12	1.263		
	DV15	0	PK1	0		JE1	0	AN19	1.479		
	MR7	0	DV12	0		HA1	0	PK1	1.978		
	AN19	0	DV2	0		AN19	0	BY13	1.982		
	SU3	0	HA1	0.498		AN15	0	BY11	2.763*		
	BY11	0.805	AN19	0.506		WM5	0	WM5	2.957*		
	AN15	1.706	BY11	0.812		MG31	0	DV2	3.292		
	PK1	2.464	DV15	1.823		SU3	3.416	AN15	5.872**		
	DV2	2.740	MR5	5.158		DV2	5.691	DV15	5.901**		
			AN15	5.911**				MR5	14.098***		

*P < 0.05.
**P < 0.025.
***P < 0.01.

TABLE VII

CORRECTED D^2 VALUES FOR MIDDLE CUMBERLAND MALES AND FEMALES

Site	Males		Females		Site	Males		Site	Females	
DV2	(n=3)		(n=4)		DV36	(n=1)		DV54	(n=1)	
	SU3	0	DV54	0		MR7	0		DV12	0
	DV36	0	DV12	0		SU3	0		JE1	0
	WM5	0.928	BY13	0		BY13	0		DV2	0
	BY13	1.055	WM5	0		WM5	0		AN19	0
	PK1	2.129	MG31	0		BY11	0		BY13	0
	MG31	2.740	JE1	0.200		DV15	0		WM5	0
	JE1	2.815	BY11	0.949		JE1	0		MG31	0
	HA1	3.401*	HA1	1.069		MG31	0		BY11	0
	BY11	3.981*	AN19	1.566		DV2	0		MR7	0
	MR7	5.691	PK1	1.881		PK1	0		HA1	0
	AN19	6.364	DV15	1.946		HA1	0.420		PK1	0.049
	DV15	6.488	AN15	3.282		AN15	4.510		DV15	1.006
	AN15	12.423*	MR7	3.292		AN19	7.204		AN15	3.075
			MR5	7.207					MR5	8.877
DV15	(n=1)		(n=4)		SU3	(n=1)		DV12	(n=1)	
	AN19	0	DV12	0		PK1	0		DV54	0
	MR7	0	DV54	1.006		DV2	0		PK1	0
	PK1	0	MG31	1.823		DV36	0		DV2	0
	DV36	0	DV2	1.946		JE1	0		BY11	0
	JE1	0	BY13	2.290		BY13	0		BY13	0
	BY11	0	PK1	3.411		WM5	0		MG31	0
	MG31	0	BY11	3.474**		HA1	0		DV15	0
	HA1	0	WM5	4.131***		BY11	0		JE1	0.185
	WM5	0.626	HA1	5.572***		MG31	0		AN15	0.510
	BY13	1.306	MR7	5.901***		AN19	0		MR7	1.263
	AN15	1.523	JE1	6.049*		AN15	1.703		HA1	2.018
	SU3	3.188	AN15	7.745***		DV15	3.188		WM5	2.263
	DV2	6.488	AN19	8.423*		MR7	3.416		MR5	8.262
			MR5	14.758***					AN19	9.914
WM5	(n=17)		(n=9)							
	DV36	0	DV54	0						
	MR7	0	AN19	0						
	BY13	0	JE1	0						
	MG31	0	DV2	0						
	SU3	0	BY13	0						
	HA1	0.476	MG31	0						
	DV15	0.626	BY11	1.404*						
	JE1	0.656	HA1	1.706*						
	DV2	0.928	DV12	2.263						
	BY11	1.064	MR7	2.957*						
	PK1	2.087	PK1	3.078						
	AN19	2.450	DV15	4.131***						
	AN15	4.404	MR5	4.829						
			AN15	6.061***						

*P < 0.05. **P < 0.025. ***P < 0.01.

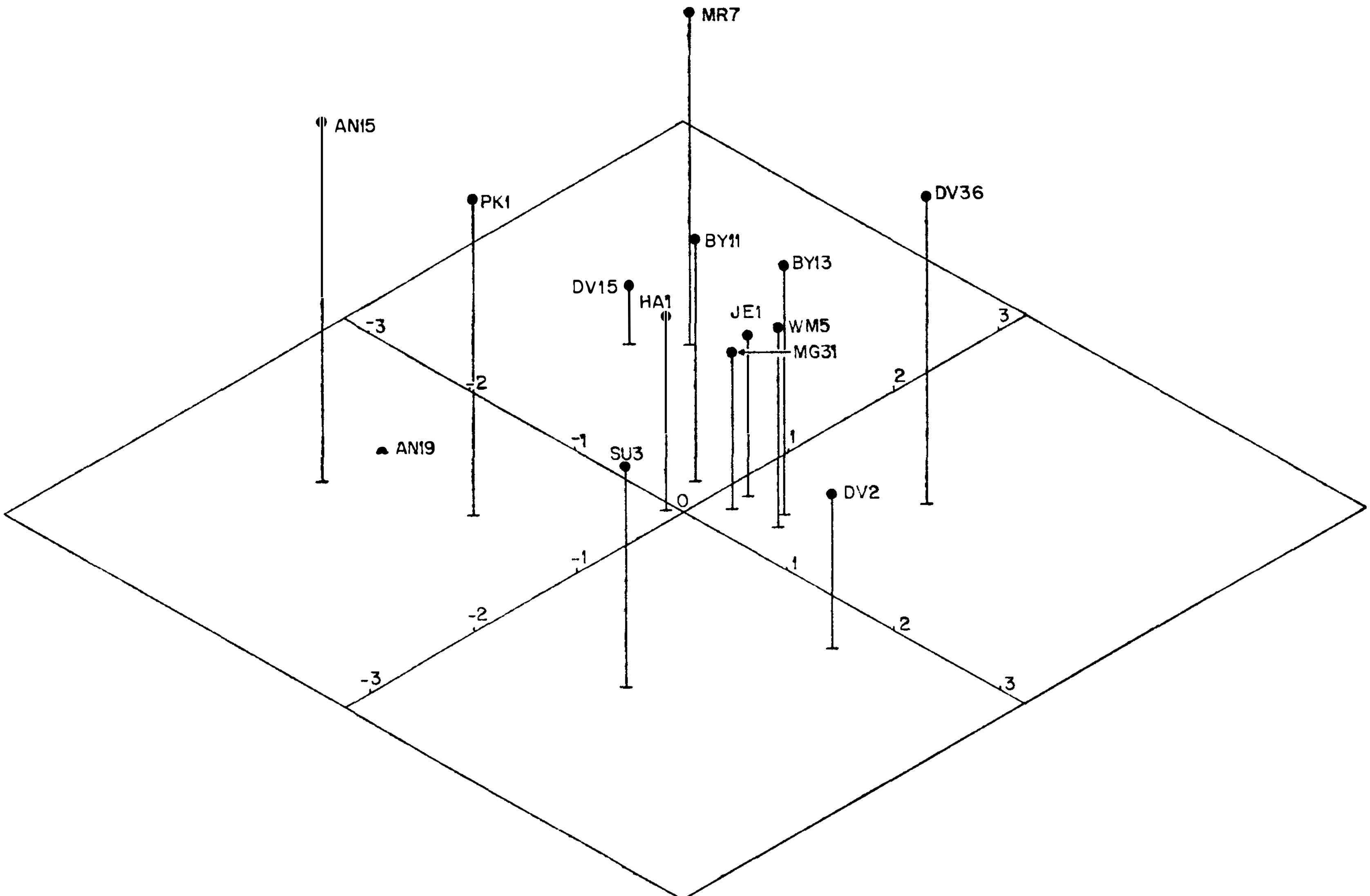


Figure 4. Three-dimensional projection of distance relationship of Mouse Creek, Middle Cumberland, and Dallas males. These three dimensions account for 73.75 percent of the variance.

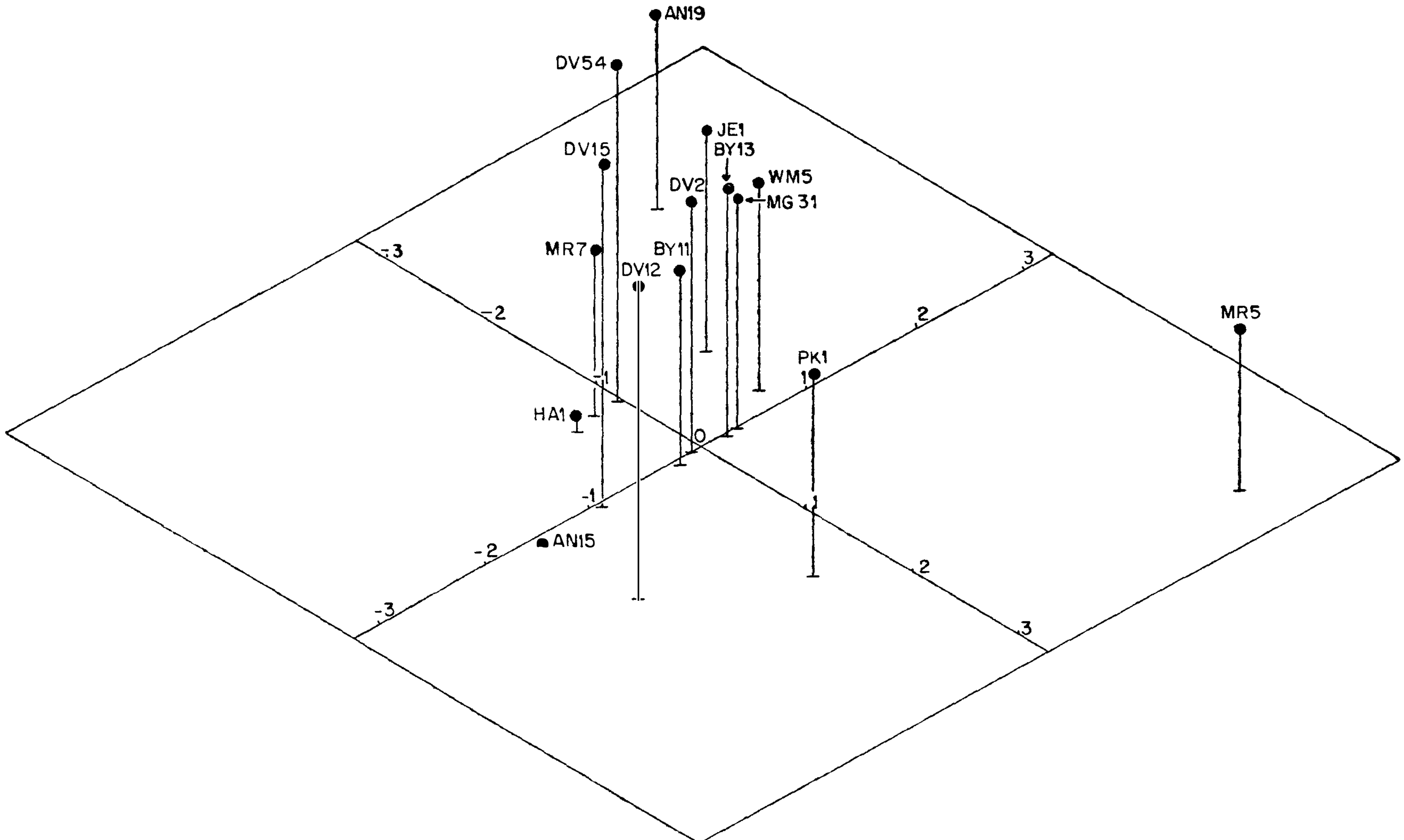


Figure 5. Three-dimensional projection of distance relationships of Mouse Creek, Middle Cumberland, and Dallas females. These three dimensions account for 75.46 percent of the variance.

1. Null Hypothesis: The Mouse Creek people are morphologically indistinguishable from the Middle Cumberland and/or Dallas people.
2. Alternate Hypothesis: The Mouse Creek people are morphologically distinct from the Middle Cumberland and/or Dallas people.

If a movement such as that proposed by Lewis and Kneberg actually took place, then the first part and possibly all of the null hypothesis could not be rejected. If this was not the case, then the alternate hypothesis would seem likely. An examination of the raw D^2 values in Table IV (p. 51) and the diagrammatic representations of these corrected values in Figures 2 and 3 (pp. 51-52) will help to clarify these relationships.

When compared to the other two groups (see Table IV and Figure 2), the Mouse Creek males are found to be indistinguishable, so the entire null hypothesis cannot be rejected. The Mouse Creek females (Table IV and Figure 3) do not differ significantly from the Middle Cumberland females, but they do (at the 0.025 level) when compared to the Dallas females. The Dallas males differ significantly (0.025 level) only from the Middle Cumberland males, and the Dallas females are distinct from both the Middle Cumberland and Mouse Creek females at the 0.01 and 0.025 levels, respectively. All of the results comply completely or in part with the null hypothesis; the Mouse Creek people are in fact morphologically indistinguishable from the Middle Cumberland people, as are the Mouse Creek males when compared to the

Dallas males. This result strengthens the Lewis and Kneberg hypothesis. However, the close relationship of the Mouse Creek and Dallas males and yet the opposite relationship of their females remain to be explained.

The Mouse Creek/Dallas relationship might be best explained by the distinct social relationships engendered by an influx of alien people into an area. A distinctive relationship might be expected if the descent system and residence rules of the two groups were matri-centered. In a similar study, Wright (1974), using some of the same Dallas skeletal material with a different statistical approach, noted basically the same phenomenon and ascribed it to a matrilineal and matrilocal social organization. This type of kinship system is a likely possibility since most of the major historic groups in the Southeast, including the Creek tribes (Swanton 1922), were matrilocal. If this had been the case, the females would have remained in their respective villages (as a homogeneous group) while the males would have been relatively mobile between villages (and appear heterogeneous). With the passage of time, the females within the various villages involved in male exchange would become morphologically more similar. Since the Mouse Creek and Dallas females--unlike the males--differ significantly, it might suggest that the groups were together for only a short time. This would conform to Lewis and Kneberg's hypothesis that the Mouse Creek or Yuchi moved into the eastern Tennessee Valley sometime after 1540 A.D. and were forced out by the Cherokee in 1714. It may also be suggested that the cultural, social, and linguistic--if the Mouse Creek were actually antecedent to the historic Yuchi--differences between the groups may have initially hindered gene flow. The amalgamation of the Mouse Creek re: (Middle Cumberland) people with the Dallas may also account for the appearance of stone-lined graves in Dallas sites. Not only do the D^2 values express the biological similarity between the groups due to gene flow, but they may actually be due to the occurrence of Mouse Creek males at Dallas sites or vice versa.

Although the biological distances of these three groups do seem to support the Lewis and Kneberg hypothesis, other equally viable explanations for this phenomenon exist. In order to ascertain a more in-depth view of these relationships, the three cultures involved were divided into their respective sites and the skeletal material from each was then compared. The results of this procedure are presented in the following section.

Interpretation of Distances Between the Sites

Inspection of the Mouse Creek sites in Table V and Figures 4 and 5 add further support to the Lewis and Kneberg hypothesis. Of the females from the three Mouse Creek sites studied, only those from the Rymer site (40BY11) differ significantly from any of the Middle Cumberland sites (specifically the Arnold and Ganier sites). This is not surprising for the Arnold (40WM5) and Ganier (40DV15) females not only differ from those from the Rymer site and many of the Dallas sites, but they also differ from each other (see Table VII). These differences could be produced by any number of factors, e.g. temporal differences, archaeological misclassifications, or perhaps social factors.

Unfortunately, the Rymer site was excavated during the late 1930's prior to the introduction of radiocarbon dating techniques; both the Arnold and Ganier sites have been radiocarbon dated, and such dates for the Rymer site would have been extremely enlightening. Lewis and Kneberg (1939) also note that this site contained an earlier component affiliated with the Hamilton phase. It is possible that a misclassification of one or more Hamilton burials as Mouse Creek may be responsible, not only for the differences between these Mouse Creek and Middle Cumberland females, but also for the differences between the Rymer site females and those females from a number of the Dallas sites (40HA1, 40MR7, 40AN15, and 40MR5). The females from the other two Mouse Creek sites, Ledford Island (40BY13) and Ocoee (40PK1), are found to differ from only three other sites, all of which are Dallas (see Table V). The Mouse Creek males, when compared to those from the other sites, differ significantly only from the Herman site (40DV2) males.

The Dallas people were assumed to differ somewhat from the Mouse Creek people and to be exceedingly different when compared to the Middle Cumberland group. The distances of the Dallas samples from the others are best expressed in

Table VI and Figures 4 and 5. As expected, some of the Dallas females are distinct from a number of the Mouse Creek and Middle Cumberland females. However, there is also a significant difference in the females among some of the Dallas sites. This is especially true for the Johnson Farm site (40AN15); the females from this site differ at the 0.05 level or greater from other Dallas females except those from site 40HA1. McNutt and Fisher (1960) describe the site as having an earlier Candy Creek component, which is also the case for the Dallas site (40HA1). As with the Rymer site, misclassification of Woodland burials as Mississippian may be responsible for these distances. However, temporal and social factors are also a possible consideration. The Dallas males are indistinguishable from those of the other sites with the exception of the distances between sites 40HA1 and 40DV2, and sites 40AN15 and 40DV2. The male/female intersite relationships (see Tables V, VI, and VII), as discussed above, are strongly suggestive of a matrilocal and matrilineal kinship system for all three groups.

Of particular interest to this study is the Hiwassee Island site (40MG31). Geographically, this site is closer to the Mouse Creek sites than any of the others (see Chapter III, Figure 1) and was probably contemporary with some of them. Hiwassee Island is the only Dallas site represented in this study in which neither the males nor the females differ when compared to those from either the Mouse Creek or the Middle Cumberland sites. The females from the site do differ from the Johnson Farm females (40AN15), a supposed Dallas site. Once again, the Lewis and Kneberg hypothesis is supported. However, a second and equally acceptable interpretation of the Hiwassee Island relationships may be made and will be discussed in the following.

The very fact that the skeletal remains from the Mouse Creek sites are biologically related to those of both the Middle Cumberland and the Dallas sites gives credence to the Lewis and Kneberg hypothesis. However, factors other than a mass movement of people may be responsible for the relationships, and an alternative hypothesis may be proposed. All of the sites involved in this study may have belonged to the same linguistic stock, thus providing greater opportunity for genetic ties. Caldwell (1958:64) states: "It is becoming increasingly likely that some of the first Mississippians belonged to the Muskogean linguistic stock, of which the principal southern tribes of the historic period, Creek, Choctaw, Chickasaw, and dozens of minor dialect groups also were members." Wright (1974:55) concludes ". . . that the Dallas were probably Muskhogean-speaking and not the direct ancestors of the Overhill Cherokee in east Tennessee." It may then be suggested (though it does not necessarily follow) that the Mouse Creek, Dallas, and Middle Cumberland people all represent Muskogean speakers with some sort of tribal separation.

Metric studies of linguistically defined groups are not uncommon in physical anthropology. For example, Hanna

(1962) using D^2 separates several southwestern tribes according to language groupings. Friedlaender et al. (1971:268) show ". . . that the biological variation is related to geographic, linguistic, and migrational differences." And in an earlier blood group study using Indian populations on the Northwest Coast, Hulse (1957) judged the linguistic barrier to gene flow to be stronger than barriers produced by either geographic or cultural differences. The language of a group is therefore a significant factor in determining its biological relationships.

A common language among the three groups would have been conducive to trade and may also have fostered a number of political alliances through the years, thus promoting gene flow. Trade among the residents of these sites may be evident from the relationships of their males (see Tables V, VI, and VII, pp. 53-56); trade was conducted by the males, who were free to move from site to site throughout the area. The geographic location of the Hiwassee Island site (40MG31) and the fact that it does not differ from any of the other sites, except for the 40AN15 females, may reflect the importance of the Tennessee and Hiwassee rivers as routes of trade and transportation.

Myer (1928b:837-839) also describes a trail which ran from the Hiwassee River to the Nashville area.

> The Black Fox Trail began at the Cherokee settlements along the Hiwassee River in east Tennessee. . . . [It crossed the] Tennessee River just above the mouth of Hiwassee a short distance from Chief Jolly's Island (now Hiwassee Island). . . . [The trail continues westward through the Sequatchie Valley, across the

> Cumberland Plateau, and to the Black Fox Spring near Murfreesboro.] From Black Fox Spring the trail continues on to Nashville by two routes . . . .

The existence of this trail in prehistoric times could have provided the avenue for gene flow between the Middle Cumberland and the Dallas and Mouse Creek populations.

Temporary alliances between groups were fairly common. During historic times, trade increased in frequency and alliances between groups formed and dissolved readily. For example, in 1761 a number of Chickasaw and Catawba allied themselves with the English against the Middle Settlements of the Cherokee (Corkran 1962). It is also not uncommon for small groups from one population to settle with a second. Corkran (1962:63) notes that in the 1750's ". . . a score of Shawnee from above Ohio appeared at Chota seeking permission to settle among the Overhills." Such alliances during prehistoric and protohistoric times represent another avenue for gene flow.

Either the Lewis and Kneberg hypothesis, concerning a movement of people into the area, or the above alternative, which suggests gene flow produced by trade, travel, or alliances within the area, are viable, though not mutually exclusive, possibilities in the explanation of this data. If only the metric data were available, the alternative hypothesis would be more likely. However, in view of both the metric and cultural data, Lewis and Kneberg's idea of a movement of Middle Tennessee people into the eastern Tennessee

Valley is more appealing; but the alternative hypothesis cannot be entirely dismissed.

CHAPTER VI

SUMMARY

The purpose of this thesis was to examine the biological validity of the Lewis and Kneberg hypothesis concerning the Middle Tennessee origin of the Mouse Creek people. To this end, Mahalanobis' Generalized Distance (D^2), a multivariate statistical approach, was employed using 22 cranio-facial measurements. The crania from three Mississippian groups (the Mouse Creek phase, the Dallas phase, and the Middle Cumberland Culture) were used. Each group was archaeologically defined and consisted of individuals from sites conforming to these definitions. The relationship of the Mouse Creek people to the Dallas and Middle Cumberland was of primary concern; however, certain peripheral interpretations concerning intersite relationships are also made. To establish these relationships, two approaches were taken: (1) the biological distances between the three groups were examined; and (2) the three groups were divided into their individual sites, and the distances between the samples from these sites were examined. A summary of the results from these two approaches appears as follows:

1. The analysis of the biological distances between the three groups indicates that:
   a. The Mouse Creek males are indistinguishable at the 0.05 level from the Middle Cumberland or Dallas males.

b. The Mouse Creek females differ at the 0.025 level from the Dallas females, but they do not differ at the 0.05 level from the Middle Cumberland females.

c. The Dallas males differ only from the Middle Cumberland males at the 0.025 level, and the Dallas females differ from both the Middle Cumberland (0.01 level) and Mouse Creek (0.025 level) females.

2. The analysis of the skeletal material from the individual sites indicates that:

   a. Of the Mouse Creek females, only those from the Rymer site (40BY11) differ significantly (see Table V, Chapter V, p. 53) from any of the Middle Cumberland sites (specifically, the Arnold and Ganier sites), and those from Ledford Island (40BY13) and Ocoee (40PK1) differ from only three sites, all of which are Dallas.

   b. The Mouse Creek males are found to differ only from the Herman site (40DV2), a Middle Cumberland site.

   c. The only significant difference among the Middle Cumberland sites are found between the Arnold (40WM5) and Ganier (40DV15) females (see Table VII, Chapter V, p. 56).

   d. There are several differences among the Dallas females; this is best exemplified by the Johnson

Farm (40AN15) females, which differ at the 0.05 level or greater from all of the other Dallas females except those from site 40HA1 (see Table VI, Chapter V, p. 54).

e. Only two differences at the 0.05 level are found among the males from the Dallas sites (i.e., 40HA1 to 40DV2, and 40AN15 to 40DV2).

f. The Hiwassee Island site (40MG31) is the only Dallas site in which neither the males nor females differ at the 0.05 level when compared to those from either the Mouse Creek or Middle Cumberland sites; however, the females do differ from one other Dallas site (40AN15).

Conclusion

In view of the above relationships, a number of suggestions may be made. That the Mouse Creek people are not significantly different from the Middle Cumberland people supports the Lewis and Kneberg hypothesis concerning the migration of this group into the eastern Tennessee area. However, an alternative explanation may be made for the relationships expressed by the three groups as well as the individual sites. These relationships could have also been produced by gene flow resulting from years of trade, travel, and political alliances among sites throughout the Middle and East Tennessee area. It was suggested in the preceding chapter that the groups involved were from the same linguistic stock--possibly, though not necessarily, Muskogean. A common linguistic base would be conducive to a number of social, cultural, and political relationships. The Hiwassee Island site (40MG31), as stated above, is indistinguishable from all of the sites used in the study except for the Johnson Farm site (40AN15). This may exemplify the importance of the Tennessee and Hiwassee rivers and the Black Fox Trail as avenues of trade and transportation. This site is also geographically closer to the Mouse Creek sites than any of the others studied, and its failure to differentiate from these or the Middle Cumberland sites may further strengthen the possibility of a movement of Middle Cumberland people into the eastern Tennessee Valley.

The general homogeneity, as expressed in Tables V, VI, and VII and Figures 4 and 5 in Chapter V (pp. 53-58), for the entire Middle and East Tennessee areas is indicative of the importance of gene flow as produced by the widespread circulation of prehistoric and protohistoric peoples. However, in consideration of the present metric analysis and the archaeological and ethnohistoric data presented in Chapter II, the author finds the Lewis and Kneberg hypothesis a likely possibility.

From the results of this study a number of interesting suggestions were made, such as a matrilocal kinship system for the three groups, the importance of the river system and overland trails to gene flow as expressed by the Hiwassee Island site, and the possibility of cultural misclassification of skeletal material from the Johnson Farm and Rymer sites. These suggestions are peripheral to this study; however, they tend to further exemplify the potential held by such multivariate approaches for the archaeologist. Archaeologists have long stressed the interpretative importance of material culture, and it is time that the importance of physical data used in conjunction with cultural data be realized.

Recommendations

The present study might be expanded by the addition of skeletal material from the Carter's Dam area in Murray County, Georgia, in particular the Bell Field and Little Egypt sites. These sites, as discussed in Chapter II, are suggested by Garrow (1975) to represent a possible area of origin for the Mouse Creek group in East Tennessee. The relationship of these sites to those in the eastern Tennessee Valley would be of interest to this study. It would also be instructive to compare the skeletal material from Mouse Creek sites in East Tennessee to historic Yuchi skeletal material. This comparison would act as a test of Lewis and Kneberg's belief that the Mouse Creek people were antecedent to the Yuchi. Due to the problem of skeletal preservation in the Southeast, the author has no knowledge of whether or not adequately preserved skeletal material exists for these studies.

Poor preservation makes it extremely difficult to obtain an adequate sample size using crania for such studies.

In the future, it would be advantageous to develop measurements on fragmentary crania, particularly in areas of dense bone which preserve well. The use of post-cranial measurements as described by Van Vark (1970) would also aid in expanding both sample size and the number of sites that might be used.

Skeletal studies of southeastern archaeological populations are long overdue. It is the author's hope that such studies will continue, and that the archaeologist and skeletal biologist will work more closely together in the future to unravel the prehistory of this area.

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